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FREEWAY MANAGEMENT TRENDS

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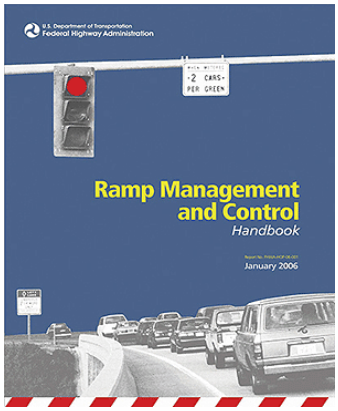
Welcome to the first issue of the *Freeway Management Trends*. This quarterly publication is prepared by the FHWA Office of Operations Freeway Management Program in order to report on initiatives and developments aimed at freeway operations and traffic management and to provide a platform for practitioners engaged and interested in activities focusing on the use of integrated and coordinated freeway systems and proactive freeway management to improve the safety efficiency and reliability of travel on the nation's freeway facilities.

Ramp Management and Control Handbook

Ramp management is the "application of control devices, such as traffic signals, signing, and gates to regulate the number of vehicles entering or leaving a freeway, in order to achieve operational objectives". Most ramp management strategies are employed to balance freeway demand and capacity, maintain optimum freeway operation, improve safety on the freeway or adjacent arterial street(s), or give special treatment to a specific class of vehicles. Ramp Management can offset congestion and safety problems that affect efficient and safe operation of traffic on ramps and or the facilities to which they connect. In doing so ramp management helps achieve greater return on transportation infrastructure investment and contributes to the realization of predetermined goals and objectives.



To better manage and control traffic on freeway entrance and exit ramps, the Federal Highway Administration (FHWA) has developed the *Ramp Management and Control Handbook* (FHWA-HOP-06-001, EDL No. 14242) providing guidance and recommended practices on managing and controlling traffic on ramps with freeway facilities.

This comprehensive technical reference discusses the impacts that roadway improvement planning, designs, roadway and traffic monitoring, real-time operation, evaluation, and reporting have on the performance and management of traffic at freeway ramps. The use or application of these recommended practices will, in time, serve to enhance the use and effectiveness of various ramp management and control operational strategies and techniques.

This handbook also describes in greater depth the issues and concepts specific to ramp management and control that were presented in Chapter 7 of the *Freeway Management and Operations Handbook* (FHWA-OP-04-003, EDL No.: 13875).

Ramp Management Strategies

Ramp Metering is the application of traffic signal(s) installed at freeway entrance ramps to control the rate at which vehicles enter a freeway facility. Ramp meters have been deployed in metropolitan areas all across the United States, and have been in use for over a half century. The purpose of ramp meters is to smooth the flow of traffic entering a freeway from a ramp, allowing more efficient use of existing freeway capacity.

Ramp Closure is the application of gates, barriers, or other physical means to temporarily or permanently restrict vehicle access to and from an entrance or exit ramp. In most cases, ramp closure is considered for its safety benefits such as at locations with severe geometric limitations; however, ramp closure may be considered for managing special event traffic or controlling traffic in or around a work zone. Depending on conditions, ramps may be closed to all traffic, or to specific vehicle classes on a temporary, intermittent, or permanent basis.

Special Use Treatments for ramp management focus on providing preferential treatment to a specific class or classes of vehicles and can be applied to either entrance or exit ramps. Special use treatments include exclusive access to ramps for a class of vehicle (e.g., high occupancy vehicle (HOV), emergency, or construction) or special lanes on a ramp for the exclusive use by these vehicle classes.

Ramp Terminal Treatments (e.g., signal timing, ramp widening, turn lanes, additional storage on arterials, signing, and pavement markings) are geared to improving localized problems at either entrance or exit ramp terminals. Treatments focus on providing solutions to problems at the ramp/arterial intersection. At exit ramp terminals, the strategies can be aimed at reducing queue spillback on the freeway, but may also be aimed at improved arterial flow by limiting the amount of freeway traffic that can access certain areas in the arterial network.

Benefits

Safety

Studies of traffic management centers using ramp meters show that freeway management systems reduce accidents by 15% to 50%. When ramp metering was in operation on the Superstition Freeway project in Arizona, rear-end and sideswipe accidents were reduced by 10%. During the periods when ramp metering was not in use, accidents increased by 33% comparing to the cases when ramp metering was in effect. Washington State ramp metering system experienced reduction in rear-end and sideswipe collisions by over 30%. In Denver, Colorado, ramp metering helped cut freeway crashes in half.

Mobility

Washington State ramp metering system provided reduction in freeway mainline congestion of 8.2%. In Madison, WI, ramp metering project improved speed variability which was reduced by 5.5 to 9.2 km/h (3.4 to 5.7 mi/h) with ramp meters. In 1995 FHWA study of ramp metering in North America found that implementing ramp management strategies in Detroit increased average speeds and volumes by 8% and 14%, respectively.

Productivity

The benefits for the Houston TranStar ramp metering project within the Greater Houston Area provided an estimated travel time savings of 2,875 vehicle-hours daily, or $37,030 per day. Due to inclement weather, incidents, and other events, these savings could be expected for about 150 days each year, for a yearly user delay savings of $5,554,500.

Efficiency

After ramp meters were experimentally turned off in the Twin Cities of Minnesota, freeway volume declined by 9% and peak period throughput decreased by 14%. The analysis conducted for the Salt Lake Valley of Utah ramp metering project, found a decrease in mainline (freeway) delay with an increase in ramp metering cycle length. For a peak-hour mainline traffic volume of 8,350 vehicles/hour and no metering, the average mainline delay was 151.2 seconds/vehicle. The greatest delay reduction, 125.3 vehicle-hours over a period of one hour, was found with an eight second metering cycle and an average mainline delay of 97.2 seconds/vehicle.

Energy and Environment

Ramp metering system in the Twin Cities of Minnesota reduced the number of acceleration-deceleration cycles and smoothed traffic flow. Fuel savings at each ramp meter ranged from 2% to 55% depending on ramp roadway geometry and daily fluctuations in demand.

Customer Satisfaction

After the Twin Cities ramp meter shutdown test, support for a complete shutdown fell from 21% to 14%. In the Twin Cities overall wait times were tolerable at ramp meters; however, in a few cases wait times measured 21 minutes. Wisconsin's Madison ramp metering system found out that most drivers obeyed the ramp meters with compliance rates averaging from 85% to 98%. A public survey conducted for this project indicated that public acceptance of ramp meters was very high.

Upcoming Events

- Traffic Monitoring Data Workshop: Successful Strategies in Collection & Analysis, May 2, 2007, Washington, DC
- Freeway and Tolling Operations in the Americas Conference, May 20-23, 2007, Houston, Texas
- TRB Freeway Operations Committee Mid-Year Meeting, May 20-23, 2007 Houston, Texas
- ITS America Annual Meeting and Exposition, June 4-6, 2007, Palm Springs, California
- High-Occupancy Vehicle Pooled Fund Study Annual Meeting, June 20-21, 2007, San Francisco, California
- TRB Traffic Signal Systems Committee Summer Meeting, July 10-12, 2007, Woods Hole, Massachusetts
- TRB Regional Transportation Systems Management and Operations (RTSMO) Committee Summer Meeting, July 23-25, 2007, Woods Hole, Massachusetts
- ITE Annual Meeting and Exhibit, August 5-8, 2007, Pittsburgh, Pennsylvania
- Transportation Management Center Pooled Fund Study Annual Meeting, August 14-15, 2007, Irvine, California

Recent Publications

- USDOT Congestion Initiative: Operations and Management - A presentation presented by Regina McElroy at the ITE 2007 Technical Conference, http://www.ops.fhwa.dot.gov/speeches/ite07techconf/index.htm
- Intelligent Transportation Systems for Traffic Incident Management: Deployment Benefits and Lessons Learned, January 2007, FHWA-JPO-07-001, http://www.itsdocs.fhwa.dot.gov//JPODOCS/BROCHURE//14288.htm
- Intelligent Transportation Systems for Traveler Information: Deployment Benefits and Lessons Learned, January 2007, FHWA-JPO-07-002, http://www.itsdocs.fhwa.dot.gov//JPODOCS/BROCHURE//14319.htm
- Intelligent Transportation Systems for Work Zones: Deployment Benefits and Lessons Learned, January 2007, FHWA-JPO-07-003, http://www.itsdocs.fhwa.dot.gov//JPODOCS/BROCHURE//14320.htm
- Intelligent Transportation Systems for Traffic Signal Control: Deployment Benefits and Lessons Learned, January 2007, FHWA-JPO-07-004, http://www.itsdocs.fhwa.dot.gov//JPODOCS/BROCHURE//14321.htm
- Planned Special Events: Checklists for Practitioners, October 2006, FHWA-HOP-06-113, http://www.ops.fhwa.dot.gov/publications/psechecklists/index.htm
- Signal Timing on a Shoestring, March 2005, FHWA-HOP-07-006, http://www.ops.fhwa.dot.gov/publications/signal_timing/00_index.htm
- Integrated Corridor Management Concept Development and Foundational Research, Technical Memorandum, Task 5.5 - Identification of Analysis Needs, August 2006, FHWA-JPO-06-041, http://www.itsdocs.fhwa.dot.gov//JPODOCS/REPTS_TE/14280.htm
- Computer-Aided Dispatch — Traffic Management Center Field Operational Test Final Report: Washington State, July 2006, FHWA-JPO-07-008, http://www.itsdocs.fhwa.dot.gov//JPODOCS/REPTS_TE//14325.htm
- Computer-Aided Dispatch — Traffic Management Center Field Operational Test: State of Utah Final Report, July 2006, FHWA-JPO-07-007, http://www.itsdocs.fhwa.dot.gov//JPODOCS/REPTS_TE//14324.htm
- FY00 Treasure Valley ITS Deployment Project Advanced Traffic Management System (ATMS) Software Procurement and Implementation Process: Final Self Evaluation Report, August 2006, FHWA-JPO-07-005, http://www.itsdocs.fhwa.dot.gov//JPODOCS/REPTS_TE//14322.htm

Feedback

If you have comments, suggestions, or ideas for the *Freeway Management Trends*, please send them via email to Jessie Yung at jessie.yung@dot.gov.